

IMPACT OF DOWNSIZING ON
SYSTEMS INTEGRATION

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IMPACT OF DOWNSIZING ON SYSTEMS INTEGRATION

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U.S. Systems Integration Program
(SISIP)

Impact of Downsizing on Systems Integration

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Abstract

Success in the growing systems integration (SI) market is based on how vendors respond to the paradigm shift from mainframe based computing to client/server and peer-to-peer computing. Vendors will need to be more agile when responding to the business process of re-engineering and information systems (IS) re-engineering, which is causing the downsizing.

Vendors will need to review their own business structure and determine the appropriate strategy to be agile while offering in-depth expertise on business and functional areas.

Vendors will need to become more aware of technology, such as object oriented development environments, which will support their efforts to create IS systems as quickly as the business they support can re-engineer itself. These technologies will require an investment in training instead of the on-the-job training that has been used by some SI vendors.

This study, one of a series on U.S. systems integration, was prepared as part of INPUT's U.S. Systems Integration Program. *Impact of Downsizing on Systems Integration* was written to make INPUT's insight available to SI vendors on how downsizing will impact their market, and, in turn, will impact how they pursue that market. There is a revolution underway and SI vendors need to prepare themselves to survive.

Conclusions and recommendations are offered to SI vendors on how they need to position themselves to be successful and survive in the new IS paradigm.

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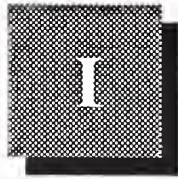
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Introduction

A

Objective and Need

The *Impact of Downsizing on Systems Integration* report was written to make available to systems integration (SI) vendors INPUT's insight into how downsizing will impact their market and, in turn, will impact how they pursue that market.

There is a revolution under way! Whether it is trade press-driven or market-driven, it is under way. For the first time in decades, there is no IBM protective market umbrella that can maintain a stable flow of technology to the information technology (IT) market and the information systems (IS) managers in the business entities.

In this report, INPUT uses "downsizing" to refer to more than just taking some non-mission-critical business applications off the mainframe and putting them into a desktop environment. A full discussion of the concept is contained in Appendix A. An illustration and discussion of all the downsizing issues can be found in Appendix B. In this report, "downsizing" will refer to the total business process of business process review and re-engineering to empower the end user, information technology (IT) re-engineering, and the re-engineering of information systems (IS) to support the end user.

The pace of change is accelerating. It is being driven by fast-track entrepreneurs funded by fast-track venture capitalists, rather than by the traditional IT companies. Stable companies (though with IBM's downsizing announcements at the end of 1992 it is becoming more difficult to define "stable") must compete with fast-track entrepreneurial management that wants to be into and out of a market in a couple of years rather than trying to exist for decades.

SI vendors who want to remain viable in this marketplace must be ready to accelerate their schedule of change to match this new entrepreneurial and media-driven “feeding frenzy” for new technology.

Downsizing has begun with technology that has superficial appeal, like GUIs and mouse control. A technology that many feel will have a major impact on downsizing and that will allow client/server concepts to move from media hype to a reality is the object-oriented development environment (OOOE). This may be that one remaining piece needed to re-engineer SI vendors into the “agile enterprises” needed to support the successful business enterprise of the 1990s.

Because of their long tradition of working with the MIS managers of enterprises, traditional SI vendors may be scoffing at the very concepts and technologies they should be training on to prepare for the middle of this decade.

This report is designed to combine the results of both INPUT’s Systems Integration Program and INPUT’s Downsizing Program. It will use research from both of these programs and outside sources to alert SI vendors to the opportunities and risks created by downsizing. SI vendors will need to re-engineer themselves to exist not only now, but throughout the time horizon of this report.

B

Scope and Use

1. Scope

The primary and secondary research for this report was part of INPUT’s continuing research on systems integration, outsourcing, and downsizing.

INPUT feels that its extensive downsizing research of the past year needs to be considered because of the tendency to be overwhelmed by the trade press coverage of downsizing. The significant issues of downsizing are presented and their impact on SI vendors is evaluated.

The report, *Impact of Downsizing on Systems Integration—Europe, 1992-1997*, issued by INPUT in Europe, was reviewed for this report. It is useful reading for anyone interested in worldwide SI engagements; however, no effort has been made to include European issues in this report.

In addition to secondary sources already considered by INPUT, this report includes material generated from interviews with SI vendors.

2. Use

This report will help the strategic planners in SI vendor organizations to start planning for the impact of downsizing on their companies. In turn, the report should give the organizations that use SI some criteria with which to design selection matrices for awarding SI contracts in the future.

The body of this report is followed by several appendixes, including the following:

- Downsizing Definition
- System Architectures for Downsizing
- Systems Integration Definitions

C

Related INPUT Reports

Impact of Downsizing on SI, Europe 1992-1997

Putting Downsizing in Perspective (January 1992)

Systems Architectures for Downsizing (April 1992)

Client/Server Applications and Markets (June 1992)

Case Studies in Downsizing (August 1992)

Systems Integration Technology Trends (April 1991)

Systems Integration Trends and Forecast, 1992-1997 (November 1992)

U.S. Professional Services Market, 1992-1997

U.S. Processing Services Market, 1991-1996

U.S. Application Solutions Market, 1991-1996

U.S. Systems Software Products Market, 1991-1996

U.S. Professional Services Market, 1991-1996

U.S. Systems Operations/Outsourcing Market, 1991-1996

U.S. Information Services Industry Sector Reports, 1992-1997 (15 reports on all major industry sections; e.g. insurance)

Market Analysis Program Cross-Industry Sector Reports, 1991-1996 (7 reports on information services markets that serve all vertical industry sectors; e.g., accounting)

Methods for Successful Systems Integration

Network Integration—A Growing Market

Systems Integration Trends and Forecast, 1992-1997

Systems Operations Management Issues and Practices

Electronic Image Processing, 1991-1996

Federal Systems Integration Market, 1992-1997

Systems Integration Market—Western Europe, 1991-1996

Systems Integration Competitive Analysis

Systems Integration Technology Trends

D

Related Research

DATAMATION, "Downsizing: The Application Migration," Nov. 15, 1992, pp37-48

CIO, "The Shape of Excellence," August 1992, pp26-32

Information Week, Chuck Appleby, "Spending for a Rainy Day," December 7, 1992, pp38-48

E

Related Material

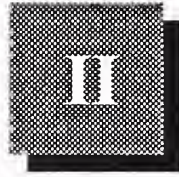
Booz-Allen & Hamilton Inc., "NeXTSTEP vs. Other Development Environments," January 7, 1992

James Martin and James J. Odell, *Object-Oriented Analysis and Design*, Prentice Hall, 1992

David A. Taylor, *Object-Oriented Technology: A Manager's Guide*, Addison-Wesley, 1992

Peter Coad and Ed Yourdon, *Object-Oriented Analysis*, Yourdon Press, 1992

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Executive Overview

A Market Characteristics

1. Overview

Personal computers (PCs) became important to business about 10 years ago as a result of IBM's influence and leadership. They were presented as individual productivity tools with shrink-wrapped applications like word processing and spreadsheets. They appeared to free end users held captive by the mainframe computers of corporate IS or by expensive remote computing systems run by outside companies. Personal computers were not designed to be used in application development, principally because of the limitations of the original operating system and users' demand for upward compatibility.

Later in personal computer history, individual workstations (IWSs)—designed around open systems and based on reduced instruction set computer (RISC) chip sets—gave users the ability to develop applications, but did not give them the same graphics user interface (GUI) installed on the PCs. (INPUT uses the term "PC" in this report to refer to both the Intel chip set-based machines and the Motorola/Apple chip set machines. "Desktop computers" refer to both the PC and IWS.)

The power brought to the user on the desktop has caused the revolution that IT is now experiencing. The SI organizations interviewed for this report all stress that the multivendor environment being created by downsizing is going to be far more complex than most users and IT organizations are ready to manage.

Also, despite the blandishments of the open systems proponents, one conservative SI company found that a UNIX server program may need to be stopped because the code developed on the UNIX testbed may be difficult to move to the production UNIX hardware.

There are now vendors, such as NeXT Computer, Inc. (NeXT), that feel that they offer the ease of use of the PC with the application development and communications ability of the IWS. Much of NeXT's development environment is based on its use of an object-oriented development environment (OODE). INPUT feels that tools based on OODE will be the driving force for code development in the late 1990s.

"Senior managers are feeling the heat to improve the performance of their organizations. Cycle times must quicken, customer service and quality must improve, business processes need to be streamlined, costs need further cutting, and more effort must be made to squeeze inefficiencies out of the organization structure." With this, the August 1992 issue of *CIO* described the environment in which chief information officers (CIOs) find themselves.

Given this, *CIO* reported that 62% of the 67 CIOs surveyed for the article, "The Shape of Excellence," rate business re-engineering "extremely important" or "important." Of the same group, 46% felt that downsizing was important or extremely important. Only 10% considered outsourcing either important or extremely important.

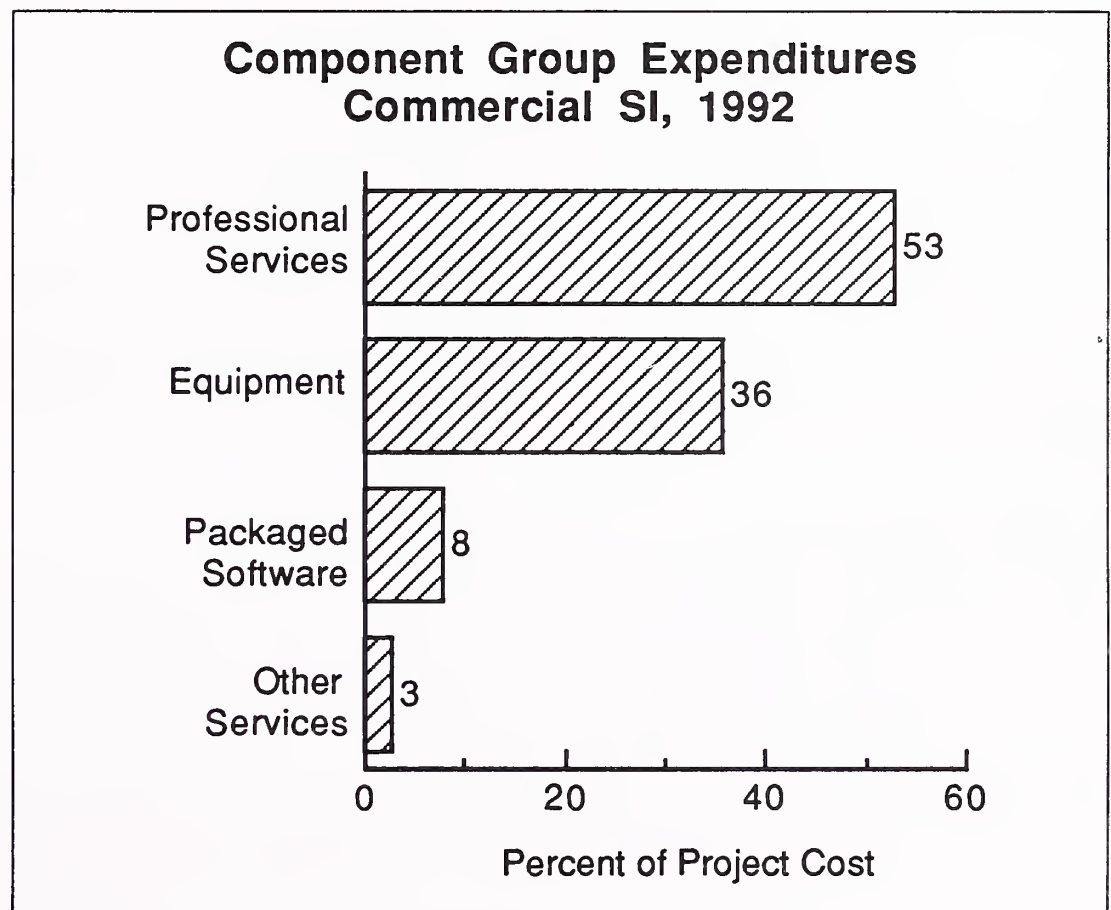
In 1992, INPUT began a series of reports on downsizing, trying to put that phenomenon in perspective to attain a realistic appraisal of what is really happening and the implications for IT in general. At the beginning of 1992, downsizing appeared to be as much media hype as reality. At the end of 1992, data is continuing to appear, indicating that 1992 was the year in which a paradigm shift in information technology took place at the large corporate level. Large companies are now following smaller companies into the complex multivendor world of client/server architecture and downsizing.

As INPUT studies information systems budgets, it has become apparent that an increasing percentage of information systems expenditures are no longer controlled by internal information systems organizations. This is because user organizations are, in many cases, becoming the buyers of solutions and control the budgets for them. The decision to use an outside vendor to provide systems integration services has become more of a business issue and less of an information technology issue.

Many of the solutions that users seek include new technologies, such as artificial intelligence, image processing, and a variety of advanced telecommunications alternatives such as LANs, WANs, and MANs. Systems integrators with good track records provide an attractive alternative to internal information systems organizations that often lack adequate resources and skills to meet new user requirements. Some internal organizations also lack the application knowledge and experience in new technologies that are required for the solutions being sought.

INPUT divides SI expenditures into four basic components: computing and telecommunications equipment, professional services, systems and applications software, and other ancillary expenditures, as shown in Exhibit II-1. INPUT's studies found that 89% of commercial SI project expenditures will be for equipment (36%) and professional services (53%). Earlier forecasts had projected that expenditures for equipment would decline as a percentage of the total. Analysis of hardware expenditures indicates that price declines are being more than offset by increases in the acquisition of client/server equipment and networks that integrate the process of delivering information throughout the organization.

EXHIBIT II-1



The difficulty of forecasting expenditures for professional services over the next five years can be discussed anecdotally. Paul Hegarty, Director of NeXTSTEP development, relates that NeXT's goal for the NeXT developmental environment was to increase code generation tenfold. When the group was unable to accomplish this, it decided that the best way to increase programming capability ten times was by reducing the produced code by ten. Vendors of other OODE tools are reporting similar results.

How will market research firms count a generated code when most of the code resides in object libraries? The only code needed will be for the development of proprietary object libraries, industry-specific object

libraries, and the messages between objects. There may also need to be a paradigm shift within INPUT's SI program on to how to measure the value of reusable code and object class libraries.

Another characteristic of the SI market is the reduction in multiple data processing centers and the creation of megacenters. In a way, this is a form of upsizing. Like application code maintenance, INPUT feels that this area will be a marketing target for independent professional services, instead of systems integration because the size of the installation will require IS personnel.

We are in the era of the agile company in which, like inventory turns, data turns will become a factor of efficiency for distributed IT systems. Business process re-engineering will be used to strip away layers of management. Thus, the enterprise will no longer have the luxury of an IS center where data is collected, verified and batch processed, and then made available to the users who originated the data.

The new paradigm will require OLTP on UNIX machines to collect, verify, consolidate, and make the data available to users on-line as the enterprise functions. None of this expertise is available in large business enterprise. For this and other downsizing architectures, large businesses will need to work with system integrators (SI).

2. Myths Becoming Realities

Downsizing is a media event—a modern-day, technological version of David's challenge to Goliath played out and reported at many levels. Little microprocessors will replace mighty mainframes with enormous savings in hardware costs. A simple "open" operating system will replace complex proprietary systems. Cheap shrink-wrapped software, purchased off the shelf, will make massive internal development efforts unnecessary. End users employing new methodologies and tools will eliminate the need for the big IS department with its systems analysts and programmers. A few executives, armed with new information technology, will replace corporate bureaucracy and reign supreme over leaner, meaner organizations without layers of unnecessary middle management. Furthermore, relatively small, upstart companies will finally bring IBM to its knees even as it tries to become leaner and meaner itself.

That is how the story goes, and both the media and corporate executives want to believe that it is true. The media is merely supporting its advertisers with "news," but corporate executives must demonstrate technological downsizing to support their own organizational downsizing initiatives.

IS management, for obvious reasons, isn't very enthusiastic about some of the ramifications of downsizing. While the media reports the demise of CIOs who have "worked themselves out of a job," those who remain are

confronted with major challenges in achieving the anticipated benefits of downsizing after having been clearly identified as being part of the problem. IS management, in turn, has identified IBM as part of its problem for the following reasons:

- After years of following IBM leadership because that route was “safe,” it has been found to lead to a mainframe trap—a position that is indefensible in terms of cost and complexity.
- IBM’s plan for getting out of the mainframe trap has not been implemented in a timely manner, appears to lack definition and support within IBM, and has only contributed to the current confusion concerning downsizing.

INPUT has been concerned about the economics of computer-communications networks since the company was formed over 15 years ago. In the mid-1970s, INPUT conducted extensive research that verified classic economy of scale within the IBM product line, and clearly demonstrated the advantages of replacing standalone systems with a hierarchical network based on large, host mainframes. It was determined that these large mainframes replaced more standalone systems than was indicated by simple price/performance ratios, and INPUT published tables of “replacement ratios” to guide clients who wanted to take advantage of the “new hardware economics.”

At the beginning of INPUT’s research on downsizing, it was apparent that the diffusion of microprocessor-based technology during the 1980s was not an orderly process, and that downsizing was being promoted as an extension of the personal computer “revolution” with little regard for proper network structure. The myopic focus on MIPS seemed to ignore both the benefits of centralization and the potential problems of downsizing.

INPUT’s initial research on downsizing tended to confirm that downsizing was being pursued without full understanding of the potential consequences. Specifically:

- The primary motivation for downsizing was found to be the reduction of IS and hardware costs, but those who had completed downsizing efforts (or who were about to complete them) no longer listed cost savings as being a primary anticipated benefit.
- Published industry case studies of complete projects also waved some red flags about the economics of downsizing efforts. For example, one company broke up the central IS function and then found that it had to hire a comparable number of IS personnel at the network nodes, and these employees were more expensive because higher level skills were required in the downsizing environment.

- Technological downsizing is being accompanied by management downsizing (specifically, reduction in levels of middle management), which probably will require more (rather than less) investment in information technology.
- The complexity of emerging networks of systems will be greater than the centralized systems being replaced, and this will require more (not fewer) professional systems personnel. This fact is being ignored by those who propose “bottom-up system development,” which emphasizes turning over systems development responsibilities to end users.
- In addition, the advocates of bottom-up system development have adopted a client/server architecture based on the assumption that a source of high-quality data will be available somewhere in the organization, and that the potential problems of distributed data base management will be magically solved as downsizing proceeds.

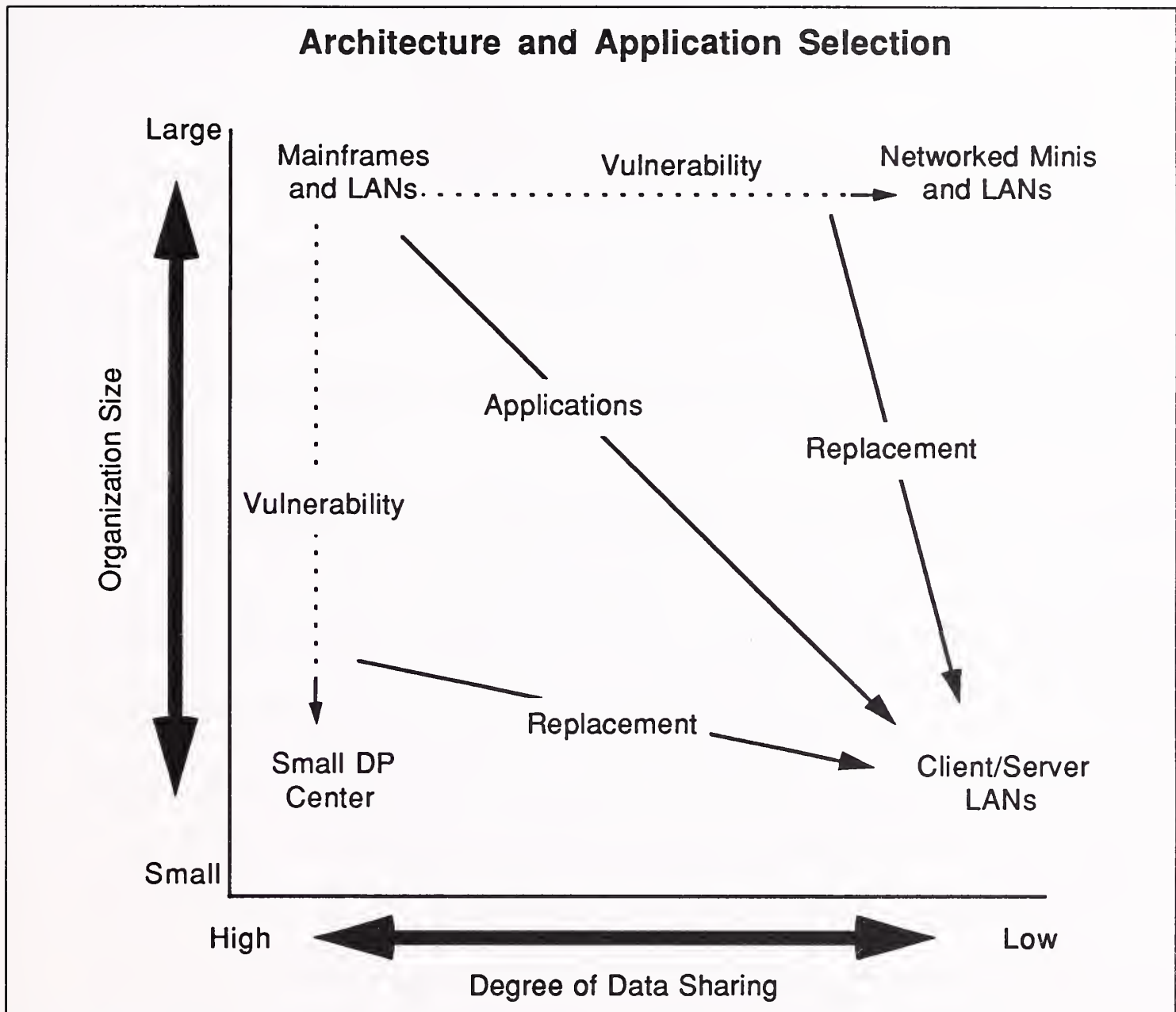
INPUT feels that it is important to understand the real economics of computer-communications networks in order to make effective use of new information technology. This requires identification and analysis of the cost factors related to downsizing. INPUT believes that this can only be accomplished by drawing on the knowledge of those who are developing comprehensive, long-range plans for downsizing current networks. Therefore, INPUT carefully selected five organizations for in-depth case studies.

The scope of this study was sufficient to provide a general cost/benefit framework for planning technological downsizing efforts, and gave warnings about many anticipated problem areas. It also provided a set of diverse cultural models that can serve as points of reference in putting management downsizing into perspective. The study made no pretense of providing a “cookbook” solution for either technological or management downsizing, but it is a useful document for planning purposes.

3. General Conclusions

The strategic case studies, the analysis of published case studies, and desk research on the distribution of programs and data in computer networks leads INPUT to conclude that organization size and the degree of data sharing across applications determine the attractiveness of downsizing from a technical point of view. Exhibit II-2 graphically represents this view.

EXHIBIT II-2



- Large mainframes being used for shared data bases are not attractive for replacement through downsizing, but specific applications may be downsized.
- The low end of the IBM product line is especially susceptible to replacement through downsizing because of the systems software burden and expense.
- Specific cost savings will be more likely to accrue when mainframe systems are replaced rapidly and transition costs are kept to a minimum.

- There can be other benefits of downsizing (including political ones), but these benefits should be carefully analyzed because downsizing can be expensive. In summary, what IS management caught up in downsizing seems to be saying is this:
- Operating executives and end users think that they can cut information systems costs by taking advantage of the vastly improved price/performance of new technologies, such as RISC workstations and networked PCs.
- We aren't too sure that any actual cost savings will result from downsizing, but the groundswell is so great that we have to 'go with the flow.'
- There is a very real possibility that downsizing may result in data problems if we aren't careful.

INPUT doesn't know how individual IS managers are handling this situation, but it is certain that a high percentage (over 80%) had specific downsizing plans, and many projects were already under way.

One vendor-based SI organization has estimated that easily 50% of the MIPS in the "glass house" will be migrating to the distributed environment.

A good example of how downsizing myths are becoming reality is with the 33,000 or so IBM Customer Information Control System (CICS) IS locations around the world. At one time, everyone knew that transaction processing would have to remain on IBM or IBM-compatible mainframes. Things are changing! INTEGRIS Inc. has announced UniKix, which will give UNIX-based hardware CICS capabilities in order to go after the estimated 50% to 80% of these CICS sites that are possible downsizing candidates. Hewlett-Packard has announced that it will be hosting CICS on its Precision Architecture-RISC (PA-RISC) UNIX processors. IBM has announced CICS/6000 to keep the worldwide enterprise transactions on IBM hardware, even if it means cannibalizing its own mainframe business.

B

Vendor Perspectives

Based on research for *U.S. Professional Services Market, 1992-1997*, INPUT estimates that the current professional services (PS) market is \$19.5 billion, about the size forecast for SI in 1997. In this larger market of IT, INPUT has detected an increasing trend to client/server technology. Research has found an increase in workstations in client/server applications. It has also detected a decline in expenditures for mainframe applications.

Downsizing has traditionally meant replacing host processors and dumb terminals with distributed, open system, relational DBMSs, LANs, etc.

This replacement has been traditionally outside the ability of any single hardware or software vendor.

The top five SI vendors have long supported firms that compete in the global marketplace. Smaller SI firms now find themselves supporting U.S. firms competing in a global marketplace, where speed and agility have become essential for competition. Thus, although companies in the U.S. may reduce their costs, they are still confronted with increasing the speed of their organization. This situation has put the users on the front lines in the battle for the existence of the company. In some companies, users have always been in this position, but now more users have the decision-making authority and IT budget to get the total job done.

When the SI vendor approached the orderly glass house with mainframe, disk farms, and terminals, the environment was understandable and usually within the umbrella of a single hardware vendor and possibly a network vendor.

Now, when the SI vendor approaches a potential client engagement, it finds a chaotic collection of PCs, LANs, data bases, and application programs. Unless an instantaneous inventory of everything is available, the “unknown unknowns” for the project could be an unfortunately large percentage of the unknowns. This all increases the risk to the SI bidder. Very likely the vendor will find a client/server functionality continuum in which application and data are shared between client and server.

The SI vendor wants to target the client/server architecture being used to downsize. This puts the vendor in a dilemma. For each application removed from the mainframe, the costs of the mainframe and its related supporting overhead must be borne by the remaining users, driving more users off the mainframe. How will SI vendors continue to support current mainframe clients while trying to generate new engagements with the users?

Downsizing impacts the vendor with respect to technology. In addition to the technologies that become associated with client/server architecture, a second series of technologies can be found as complex LANs become part of downsizing implementation plans. For example, Simple Network Management Protocol (SNMP) was born as a *de facto*, non-vendor standard. It started with the Internet community and has grown from the UNIX users to an entire enterprise, encompassing everything from Novell managed LANs to public frame-relay services.

Is the user community deciding for itself what is best for it? Consider that within the last year, SNMP surpassed IBM's SystemView as the standard most frequently used for network management and most frequently mentioned for future use, according to DataPro's Information Services Group.

Not content, SNMP developers have designed Simple Management Protocol (SMP), which they feel improves performance. Not only will it satisfy users' needs for better interconnection between management systems, it will allow the management of applications and systems, not just networks.

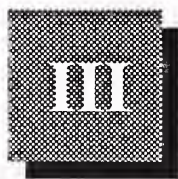
SI vendors that may have ignored object-oriented technology when it was only a data base concept, are now confronted with the reality that at least three development environments—NeXTSTEP, Microsoft Cairo, and Pink—are object oriented, as is the fastest growing multivendor network management protocol, SNMP.

C

Conclusions

INPUT can recommend two alternate strategies for successful SI vendors to help cope with the impact of downsizing on their market. First, become large enough to encompass all technologies, from business redesign and IT re-engineering through all of the traditional SI steps. Alliances must be established for industry and technology expertise.

Second, create a "collegium of competence" by establishing alliances in order to stay small and focused on the organization's expertise. Thus, no single organization needs to commit to all aspects of a successful SI enterprise, but are the overhead functions for all of the "collegium" still available under a common management structure. With rapid prototyping becoming the standard for new development, the business risk associated with using small vendors will be lessened.



SI Market for Downsizing

A

Impact of Downsizing on the SI Market

1. Overview of the Current SI Market

IBM was the leader in both the commercial and government industry sectors of systems integration in 1991. IBM has increased its focus on the SI market with formation of its Applications Systems line of business and the designation of ISSC as its primary vehicle for large systems integration engagements.

Andersen Consulting (Andersen), little known in the information services industry just a few years ago, continues to demonstrate dramatic growth in the SI market. Ranked third in 1989, Andersen moved to second place in 1991, a move based almost entirely on commercial SI revenues, where it is now the revenue leader.

Andersen has followed a long-term strategy that focuses on its clients' entire business processes. It starts with business consulting to assist in client management of change in organization and business processes, flows into implementation, and in some cases continues with a long-term systems operations contract. Andersen is vertical industry-oriented and has skills, technology and/or demonstration centers and software products with which to address most industries.

EDS is a leading processing services/SI vendor, second in SI revenues to IBM in the federal sector, and third overall. One of its strengths is its familiarity with vertical markets based on its experience in remote data processing and/or systems operations (facilities management) in most industry sectors.

EDS also benefits from the manufacturing industry and telecommunications experience of its parent (GM). Systems integration is an excellent vehicle

with which EDS can protect existing systems operations customers and develop new ones. Strong program management and risk management practices have made EDS an aggressive competitor.

Computer Sciences Corporation (CSC) made its SI mark in the government sector (both state and federal) by employing its extensive experience as a full-service vendor to win contracts. This firm is third in the federal sector and a frequent competitor of EDS. CSC also has broad commercial SI experience and has increased this business through an aggressive acquisition program.

Digital's ranking has jumped significantly over the past few years, resulting in Digital replacing Unisys in the top-five vendor ranking. Over the past year, Digital has made significant strides in unifying its systems integration line of business. An estimated 90% of Digital's revenues are from the commercial market. A significant portion of that is in the manufacturing sector, where Digital has established a strong foothold based on its equipment business.

Not all the leading SI vendors have increased their SI business quickly enough to keep pace with the growing market. Therefore, they have lost a small amount of market share. There are several factors that have contributed to this result. One is that it is very difficult for a company to manage a business with revenues of more than half a billion dollars and have it grow in excess of 16% CAGR. The market leaders are addressing this difficulty by creating suborganizations with separate market segment responsibilities. A more difficult issue for the market leaders is the success being enjoyed by newer entrants and industry—or application-focused niche companies. INPUT has counted 39 companies with SI business in excess of \$50 million in 1991.

The largest vendors will selectively make investments in niche companies, form various types of alliances and strategic partnerships, and acquire products and companies. The equipment vendors in the SI market are likely to separate into spin-off companies defined by their SI activities. This is necessary to break the stigma of a tie to the parent company's equipment solution. Bull/INTEGRIS, Control Data Corporation (CDC)/Ceridian, and IBM/ASD/ISSC are examples of this direction.

2. Economic Environment

Despite concern about the painfully slow growth in the U.S. economy in 1992, information services industry vendors reported that the environment offers significant opportunities and challenges.

- The annual increase of business in the industry of over \$10 billion still makes it one of the more attractive areas of opportunity in the economy.

- Demands to address the low level of economic growth has led to vendor projects:
 - Increasing revenues through improved geographical analysis of sales coverage
 - Improving service and product quality through client/server systems that enable users to communicate among functions more effectively

The U.S. information services industry is growing at a slower rate in the 1990s than it did in the previous decade. Although the industry is rebounding slightly from the recession, it is not likely to return to the growth rates of the early 1980s. Vendors cannot rely upon a favorable growth climate to help many of their product and service initiatives.

The industry did reach a milestone during 1990, increasing to over \$100 billion in size.

- The industry increased in size over five times during the 1980s, and is 50 times larger than it was in 1970, when the industry represented \$2 billion in user expenditures.
- By 1997, the U.S. information services industry will reach a size of \$200 billion, when the annual increase in absolute terms will be in the \$20 billion to \$25 billion range.

High rates of growth for the sale of software products and professional services provided the engine for growth during most of the last decade. As the rates for sales of these delivery modes fell back, there were concerns about continuing vigor in the information services industry.

- Growth of U.S. information services expenditures has been reinvigorated, however, by interest in outsourcing, restructuring, downsizing business applications systems and by increased use of network services in addition to continuing vigorous growth in systems integration.
- In effect, the information services industry has been shifting from sales of products and services for new applications systems to sales that will upgrade, manage, and outsource the use of information technology by users. This shift will continue because it is driven by the need to restructure business in order to achieve greater effectiveness, productivity, and revenues.

1991 results in the U.S. are analyzed below on a delivery mode basis:

- Although systems integration, systems operations, and network services are not among the top three delivery modes in size, their rapid rates of

growth (16% to 19% CAGR) are responsible for maintaining and increasing the rate of growth in the industry as a whole.

- The software products sectors are maintaining a rate of growth near or slightly above the industry average (about 12% CAGR).
- The industry averages are pulled down by the slower rates of growth in the large professional services and processing services sectors, as well as by the smaller turnkey systems sector (7% to 9% CAGR).

Growth in professional services, which was mired at a rate of 6% in 1990 when projects were delayed or dropped, rose to 9% in 1991 and 1992—still lower than the growth during any year in the past decade. In some vertical markets, growth of professional services in 1990 through 1992 was more than 50% less than growth during 1988.

Although the economic recession was the principal factor causing the drop in the rate of growth for systems integration and other information services during the past two years, it did not have an equal impact on the use of system integration in various markets or on the vendors offering these services.

- Some major vendors as well as smaller ones, had growth rates for services that were over 10% above the average results; whereas other vendors experienced less favorable impacts on revenue and earnings.
- A number of vendors of information services, such as IBM, Electronic Data Systems (EDS), Digital Equipment Corporation, ASK and American Software, have offered professional services as a step toward the use of other products or services, such as SI or outsourcing, or as a support for other services and products, such as software products or network services. Many of these vendors tend to have growth rates for the use of professional services that are above industry averages.

Many system integration vendors have been evaluating changes in objectives, target markets, types of assignments, and use of technological and other skills resulting from the impact of the economy on business markets during the past two years.

The market analysis and forecast for systems integration from 1992-1997 is more sensitive to the economic conditions than has historically been the case. Clients' budgets for information systems are growing more slowly and a small percentage show an actual decrease. Companies that are able to invest in information technology during slow economic times will be best positioned to grow their business when the recovery accelerates. There is a direct relationship between the degree of a company's automation and its ability to grow rapidly. The aggressively automated companies will gain market share during the initial recovery phases.

3. Major Buyer Issues

The current sluggish business and economic environment is the primary issue facing potential buyers of systems integration services. In this condition of uncertainty, some buyers are delaying the start of large SI programs, whereas others are looking to a modular approach with a faster payback. The slow economy has increased the competitive pressure for most companies. These pressures are forcing companies to focus on their core businesses and value added. Nonstrategic functions like systems integration and systems operations are being outsourced. Many companies are turning to technology to gain a competitive advantage by reducing costs, providing superior service, expediting product development, and improving quality and productivity. These new solutions are becoming increasingly complex as they change traditional business processes and serve new organizational structures requiring around-the-clock and around-the-world operations. Exhibit III-1 synthesizes the major 1992 buyer issues.

EXHIBIT III-1

Major Buyer Issues—1992

- The economy
- Core business focus
- Competitive demands
- Increasingly complex solutions
- New technology applications
- Unavailable skills

As INPUT studies information systems budgets, it has become apparent that an increasing percentage of information systems expenditures are no longer controlled by internal information systems organizations. This is because user organizations are, in many cases, becoming the buyers of solutions and control the budgets for them. The decision to use an outside vendor to provide system integration services has become more of a business issue and less of an information technology issue.

Many of the solutions that users seek include new technologies such as artificial intelligence, image processing, and a variety of advanced telecommunications alternatives such as LANs, WANs, and MANs.

Systems integrators with good track records provide an attractive alternative to internal information systems organizations that often lack adequate resources and skills to meet new user requirements. Some internal organizations also lack the application knowledge and experience in new technologies that are required for the solutions being sought.

B

Market Forecast, 1992-1997

1. Overview

During 1990, the domestic economy slowed down and domestic industry spent \$533 billion for plant and equipment, an increase of 5% over 1989. This was less than half of the 1988 to 1989 increase of 11%. In 1991, investment in plant and equipment was \$528 billion, a decrease of 1%. The forecast for 1992 is \$551 billion. Although industry will continue to invest in new capital equipment, INPUT believes that the recession will slow down the number of new commercial SI (CSI) programs that are begun in 1992. The slow economy, increased transfer payments, lower tax revenue, and budget deficits are also having a negative impact on the growth of federal SI (FSI) programs.

Actions by the industry to solve the business problems it faced increased expenditures for systems integration to \$9.1 billion in 1991, despite predictions of a lower 1991 GDP. INPUT forecasts that a still-cautious industry will selectively invest in new and expanded information systems in the near term, and that total expenditures for vendor-provided SI solutions will reach \$19.5 billion in 1997. This sum represents a CAGR of 16%. Narrowing margins and reluctance to invest in new information systems solutions, and much less use of outside vendors to implement them, are expected to continue to hinder demand for systems integration.

Early in the 20th century, someone forecasted that at the rate of growth in the use of telephones, everyone in the United States would need to be a telephone operator. As ridiculous as that seemed at the time, thanks to technology, we all are phone operators—just try to get through all the button pushing required to talk with some companies through their voice mail systems.

When someone looked at the trend lines in the DoD budget, an aerospace wag stated that sometime in the next century all the money budgeted for fighters would go into a single airplane to be shared by all the pilots and all the services. This forecast has yet to be tested.

As one looks at (a) the legacy systems that are being downsized to save money, (b) the needs for U.S. businesses to redesign and re-engineer their processes and to re-engineer their information technology (IT) to remain competitive, and (c) the need to reduce their backlogs, which the users need

to increase their productivity, it is easy to forecast that all IT users will need to become programmers. With word processing, E-mail, spreadsheets, and other individual productivity tools, many of the users have already become programmers.

End users, confused by the rapid changes in technology, are never exactly where they want to be. They are perennially overshooting and undershooting that elusive point at which they are making optimum use to their computing resources.

If there is a single overriding trend that should persist for the next five years, it is the one toward more coherent, enterprisewide networks. End users are being conditioned by the vendor community—and to some extent by the trade press—to expect nothing short of end-to-end compatibility in their computing infrastructures, and VARs and integrators will have to adjust. They are convinced that access to information should depend on corporate strategy, not on hardware or software compatibilities.

2. SI Market Forecast

INPUT has judged that the total information services market will grow from \$111 billion in 1991 to \$197 billion in 1996 at a compounded annual growth rate (CAGR) of 12%. Systems integration (SI) is one of the nine delivery modes in this industry.

A discussion of what INPUT means concerning systems integration and some typical tasks have been placed in Appendix C. This report will use the following to differentiate between professional services and systems integration:

Systems Integration - The combination of products (software and equipment) and services where the vendor assumes total responsibility for the development of a custom-integrated solution to an information systems need.

Professional Services - People services that support users in developing and operating their own information systems.

The following characteristics are typical of complex, multidisciplinary information systems integration programs. They form the basis of the forecasts included in the INPUT report, *Systems Integration Trends and Forecast, 1992-1997*, and are used for this report.

The information services industry has been shifting from sales of products and services for new applications systems to sales that will upgrade, manage, and outsource the use of information technology by users. This shift will continue to increase because it is driven by the need to restructure business to achieve greater effectiveness, productivity, and revenues.

The systems integration market is forecasted to grow from \$9.2 billion in 1992 to \$19.5 billion in 1997 at a CAGR of 16%. It is estimated that 89% of total 1992 SI project costs will be in the professional services and equipment components of SI, with professional services taking 48% of the project.

3. Downsizing Impact Forecast

For this report, INPUT will use secondary research from four surveys in order to forecast the impact of downsizing on SI. The first study is from DATAMATION and Cowen & Co., a New York-based international brokerage firm. It surveyed MIS managers and published results based on over 3,000 respondents in 1992. For application development tasking, it found that only 10% of new applications were headed for the mainframe. Up to 60% of the respondents were targeting new applications for PCs and workstations, leaving 30% for minicomputers. This would relegate a high percentage of the SI revenue to client/server or mainframe downsized applications.

In addition, the DATAMATION/Cowen & Co. survey found that even at IBM 308X-3090 class sites, 42 % of new applications are targeted for mainframe and 41% for PCs and IWSs.

DATAMATION/Cowen & Co. makes additional arguments for its belief in the paradigm shift to client/server downsizing by determining trends in its respondents' DBMS plans. The company found that 16% of the IS shops plan on putting their DBMS on UNIX multiuser systems next year, compared with 10% currently. Likewise, it found that 33% of firms are moving to PC LANs, up from 21% currently. It found 12% currently running a C/S DBMS and 25% planning to add one during the 1992-1993 period.

In its report, *Systems Integration Technology Trends*, INPUT surveyed users on the several technologies that are generally important to industry, their importance to their industry in 1991 and in three years, whether they have the skills to implement these technologies, and whether they would use SI to do so. The analysis showed that the top technologies in 1994 would all be related to client/server architecture and downsizing. Specifically, they are relational data bases, LANs, distributed systems, network integration, and client/server architecture.

Research for *CIO* magazine found that 60% of the 67 CIOs that responded planned on investing in downsizing technologies.

In a study released in December 1992, *Information Week* reports on its survey of 116 "top information management executives." It found that "spending on information technology in 1993 will likely increase, with the biggest jump in investments located outside the traditional domain of

information system chiefs and in areas far closer to end users." This study finds that spending on client/server computing will rise for 85% of the CIOs who responded to the survey.

Robert Heckman, of Syracuse University's School of Information Studies, warns that he is finding large portions of IT hardware and software being purchased for use outside of IS. Because branch office and business unit purchases often aren't tallied as part of the IT budget, there is a danger in relying on just IT budgets for the scope of the opportunity for downsizing.

In summary, INPUT feels that most new SI business will be in response to downsizing. Even in large mainframe sites, work proceeds on downsizing architecture. INPUT found little evidence of new SI work remaining unaffected by downsizing.

There are probably some legacy systems that will never be impacted, but these are in maintenance mode and represent potential for professional services, not systems integration engagements.

During interviews for this report, a manager from a hardware vendor SI organization stated that easily 50% of the MIPS in the glass house will move out to a distributed environment based on PCs. An international SI firm believes that CICS on the IBM RISC RS/6000 puts much of the CICS installed base in the world into play for downsizing. A marketing manager for INTEGRIS feels that its UNIX-based CICS product, called UniKix, puts 50% to 80% of the 30,000 or so IBM CICS installations into play. INTEGRIS believes that this represents the largest single market for downsizing.

INPUT believes that most new client/server applications will require SI rather than professional services. Downsizing has stripped many organizations of the expertise at the central location needed to manage outside professional services personnel. Downsizing has given the budget and the responsibility to the functional users and they should look to SI for a complete project, including hardware.

Also, there is a trend for SI firms to start adding business process redesign and information technology (IT) re-engineering to their portfolios. It is difficult to estimate how much of the PS budget will become part of the SI budget in the future, if this trend continues.

INPUT forecasts that the SI market will grow from \$9.1 billion to \$19.5 billion by 1997. The downsizing portion of that can easily be between 60% and 90%, with a CAGR better than that for SI alone.

Unresolved is the question concerning the impact of object-based development environments like NeXTSTEP and IBM/APPLE Taligent

Pink. Also unresolved is what to call PS activity, once class libraries become more common.

In summary, most of the spending for new applications will result from downsizing; almost all of that will be in the SI market; and easily 50% of *that* will be for SI professional services. Thus, by 1997, over \$10 billion of the SI market will be the result of downsizing and about \$5 billion will be for SI professional services as a result of downsizing.

In summary, downsizing already has a number of meanings within the IT arena. Its meanings range from simply moving applications to a smaller computer, all the way to completely revolutionizing the information architecture of major organizations, to something in between, like restructuring and substantially reducing the size of the IS organization. If there is a common thread, then it is due to management's expectations of more for less, looking to any source to accomplish this process. Management will also look inside and outside the company for advice.

The improvements in price/performance of hardware have broken a barrier that is permitting corporations to totally rethink how they apply IT and how they use SI vendors.

This creates confusion as well as potential. If the economic environment improves significantly, the ability to invest the resources required to quickly downsize (redesign) information systems environments can be applied at an accelerated pace.

Most observers of the IT market assume that there will be a mad dash to downsize during any window of opportunity in the current economic cycle.

Downsizing, by any definition, means leaving the rather comfortable and workable mainframe environment for the risk-laden and dangerous world of "multilingual" distributed computing. However, INPUT has determined that this area is where the new applications will be found for SI vendors.

C

Impact on Traditional SI Markets

The traditional SI markets will continue to exist. Continuing to work these markets will keep the SI vendor connected to a more static technology and possibly a powerless leadership group. The traditional market will offer maintenance, data base, and communication requirements to a company that has staffed up with the traditional mainframe operating system and communications personnel. The newer people will enter the SI work force looking for leading edge and "bleeding edge" applications with quick turnaround. It may be difficult for the traditional large SI house to offer everything to everyone. Like the vendors and enterprises they support, SI

organizations may need to downsize and rightsize to attack specific markets rather than try to be all things to all people.

Legacy systems will remain! Some are too difficult to move and some cannot be changed to generate cost savings or other benefits. The perennial backlog for legacy systems could be a target for the more traditional SI firms with broad-based technology. They would not be a target for “rifle shot technology” SI vendors.

There are several battlegrounds developing. There is a battle for the mainframe vis-a-vis downsized IWS applications and multi-user UNIX machines. The PC operating system providers and the LAN software providers are not idle. INPUT expects that the battle for the enterprise will be engaged in three dimensions with hardware, software, and networking all trying to control the enterprise.

The traditional SI market will change because of the pressure on users to change. The customer will no longer be able to wait for the larger SI organization or the internal staff to complete and deliver its monolithic code. The pressure will be for mission-critical modules to be made available to the users as they are completed. Thus, value will be perceived not as the number of lines of code written, but for the use of object libraries and similar reuse, libraries where a minimum number of lines of code are needed. The scenario will be more “plug-and-play” like a stereo system rather than building each component from scratch as in the days of “hi-fi” kits.

D

Types of SI Downsizing Opportunities

1. Overview

Downsizing is one way to reduce costs. Cost reduction can be handled in several ways. The downsizing that is strategically important to SI vendors is that associated with business process re-engineering, which has an impact on the whole company and opens up opportunities for the SI vendor.

Downsizing has come to mean a company's replacement of all or a significant portion of its applications formerly based on mainframe equipment with applications on midrange computers, PCs, IWSs, and LANs. This may be accompanied by removal of the mainframe or reconstitution of the mainframe into a LAN file server, network switch, or data base manager.

At such a time, the company goes from working with the mainframe manufacturer to becoming involved with several companies that each have their own technology and jargon, each moving at its own technology pace. Some, like Microsoft and Novell, are trying to provide the software to

control the total enterprise. The downsizing takes place within the enterprise and the question then becomes whether the opportunities within the enterprise increase, decrease, or remain essentially the same for SI vendors.

In the minds of many people, downsizing just means moving applications from the glass house mainframe to a distributed LAN environment. This can happen in two ways, and the difference in these two ways could have an impact.

The first way is for the users to start using PCs as individual islands of automation. Next, they connect them with LANs. Soon there is a need to access the mainframe for data because users discover that the data they are using is out of sync with the corporate data base on the mainframe. In this case, the downsizing drive is from the users, with applications developed organically. There is a “pull” to bring data down to the distributed architecture.

When the IS department is unable to enforce computer standards, there is a great potential for incompatibility, as systems are purchased by the users for ad-hoc applications that grow into corporate IS systems. This has led to user demands for standards that will allow applications to communicate even if the applications themselves run on proprietary systems. So-called “open systems” are still sold in too many dialects.

The second kind of downsizing is the “push” downsizing, where the strategic decision to downsize starts at the level of the IS organization or above. The pressure starts at the top, with the MIS mainframe. Applications are re-engineered to include client/server architecture, use workstations or PCs, introduce corporate LANs, etc. In this business environment the SI vendor could be called in to design the architecture and then manage the re-engineering of the IT architecture.

Traditionally, in-house mainframe organizations, working with their vendors, have controlled the top-down rollout of applications based on available talent and budgets. INPUT expects that as long as the IS people remain in control, the top-down rollout will require fewer outside resources than a bottom-up rollout, which comes from functional organizations with P&L responsibility. The user functional organizations are more likely to go outside for professional help.

Another factor that develops as organizations downsize is the speed at which the application is rolled out. Top-down downsizing is constrained by the organization and is carefully controlled. In a way, this has encouraged the functional people to buy PCs because they felt that they would be able to more rapidly develop applications and roll them up from the bottom.

Another change observed by INPUT is that in the days of the mainframe, the hardware was selected. This resulted in a locked-in relationship with a vendor. The IS department looked for applications to run on that hardware.

That was the time when seemingly every one of the new entrepreneurs in Silicon Valley or around Route 128 would write their first package for IBM equipment. Their strategic plan then became for which of the "Bunch" of the other computer equipment vendors to write a software version next. Now, the user selects the package needed and then finds the equipment that provides the most cost-effective solution or the best price/performance.

Often, even before there is a re-engineering of the application, there may be a business process re-engineering of the enterprise. Some mainframe vendors are now restructuring their professional services and their SI organizations to more readily serve the business process re-engineering demand.

Benefits that accrue to the organization include reduction in expenditures for hardware, and possible reduction in IT internal personnel. This will result in open systems, transaction processing in open systems, object-oriented data bases, and multimedia applications on the desktop.

Whether the SI opportunity comes from top-down or bottom-up, strategic IT planning, or from just a desire to reduce costs, downsizing creates opportunities for the SI vendor.

2. New Opportunities

Most well-run organizations will start by downsizing the input and output of data from the mainframe to the desktop environment. Most organizations will realize that for data base management and transaction processing, the PC and IWS does not offer the same stable environment or robust tools that are available in the mainframe environment. In an IS-controlled downsizing activity, there will be the top-down push to move the collection and the reporting of transactions out to the downsized systems. Secondly, the mission-critical applications will remain on the mainframe as long as possible, even when the enterprise works with the non-mission-critical applications in a networked architecture.

In a less well-controlled enterprise, where desktop processing has grown outside the control of IS, the systems will be developed in a less-controlled environment. In this case, the desktop applications make demands on the mainframe for corporate data.

As part of INPUT's early 1992 downsizing research, INPUT developed a model of downsizing projects already completed, those being completed, and those contemplated for the future. This illustrates the diversity of

applications and the knowledge that will be required for survival in the future.

As a cautionary note, remember that much of this data was developed in discussions with IS professionals. The “stealth” systems now running on individual and networked PCs and IWSs unknown to IS are far more difficult to quantify. We all know that they are out there and will be extremely important in companies that are under extreme competitive pressure.

In many cases, companies that are downsizing will be redesigning their business processes in order to compete more effectively in the market. They will be attempting to create what INPUT calls the “agile enterprise.” The users in this new agile enterprise have the budget and are empowered to seek SI vendors that can match the agility of this new enterprise. Users in the new agile enterprise will put greater demands on their SI vendors to provide the complete solution, including cost justifying the hardware to support the applications. The IBM umbrella will not be there to make the choice of hardware easy. The new agile SI enterprise will need to understand the cost/performance curves of the new RISC architecture and be ready to justify any selection.

These new agile SI vendors must be ready to match the users’ ability to re-engineer their business processes and their IT architecture with rapid prototypes of the IT-based solutions.

Risk management has always been a component of SI projects. However, with the projects becoming more of a rapid prototype in cooperation with the user and less the delivery of a complete system months to years after the original specifications, risk may be easier to manage in the late 1990s.

One example of the size of the projects in which SI vendors will need to participate is a General Electric inventory management system reported on by Richard Bellaver, an assistant professor at Ball State University. GE expects this system to save at least \$100 million over the next three to five years. The user group that is running the program is made up of operating groups, not IS. This gives IT responsibility to users who have direct business responsibility.

3. Impact on Old Opportunities

The development of a close working relationship between the integrator and the client becomes a key element in a successful SI engagement. This close business relationship increases the integrator’s understanding of the client’s business needs. This involvement assures the integrator of an inside track for providing future software and services, some not related to the SI project.

INPUT research shows that many downsizing decisions are now parts of business process re-engineering and not IS decisions. IS may therefore lose power and people as the enterprise takes its "downsizing" savings upfront by reducing mainframe budgets for equipment and personnel, rather than after such savings are realized. This focuses the effort, but can make IS a hollow support organization.

INPUT estimates that it will be years before most of the traditional mainframe-class machines are gone. This becomes important as the distributed systems look to the mainframe for certified corporate data.

In the past, as new techniques were developed, they tended to leave behind the pre-existing technologies. 4GLs and 5GLs and RDBMSs all require companies to leave behind the legacy systems of the time unless a business case could be made for migration, conversion, or re-engineering. Object-oriented techniques may be one of the first technologies to permit the legacy code to be used in new systems. By using a technique called "wrapping," a programmer can take an application written in a 3GL like COBOL, define it as an object, and create an object-oriented method of accessing it. This may alleviate some of the concerns being raised within the IBM mainframe user community by IBM's announcement that it will no longer support COBOL 74 after June 1994.

Another approach is to break the old code into components, define the components as objects, and create object-oriented messages among them. Thus, a company can reuse code. This approach also allows companies to bring systems into the object arena function by function, rather than necessitating replacement of the whole system at one time.

Object-oriented techniques will give SI vendors the ability to take existing installed systems and develop reusable class libraries from them. Object-oriented techniques will also allow the introduction of advanced technology or artificial intelligence, for example, from existing class libraries.

At least one medium-sized commercial SI organization is approaching the maintenance of legacy system software as a strategic opportunity. It becomes a project like all other software projects. By using good management techniques, the organization feels that it can improve the productivity of the maintenance function and be able to make money. Some MIS organizations are spending over half of their budgets on application maintenance which represents a sizable SI market. Most MIS organizations would like to off-load this activity because off-loading would free up staff for the more exciting and productive work of developing client/server applications with the end users.

INPUT feels that OODE could be one way to reduce the backlog that exists with legacy systems. With existing class libraries of fundamental objects to handle user interfaces and class libraries for vertical market applications, all

the developers would be required to develop the objects for their specific applications and the messages for exchanging information between objects. In this way the reduction of the backlog could be speeded up!

Exhibit III-2 summarizes key recommendations from the research for *Systems Integration Technology Trends*. In many respects, the recommendations are not new to SI vendors, but they serve to re-emphasize the need to stress the business value of technology rather than the technology itself.

EXHIBIT III-2



SI vendors faced with old applications software will need to develop methodologies that allow them to re-engineer current applications so as to insert new technology that is appropriate and cost effective.

This technology insertion will only be appropriate where it has direct business value and improves operating performance. Likewise, integrators will need to build awareness of their clients' applications and will have to become better at marketing to senior management.

This contrasts with dealing with new opportunities that are basically driven by user requirements and business process redesign. These opportunities are thus more closely related to mission-critical business requirements.

INPUT's research has also found structural changes in SI programs. First, the length of programs has become shorter. There is a need for short-term payback from IT systems. Second, programs have been reduced in scope. As a result, the value of programs has declined.

After years of watching IBM dance around the cost/performance of its mainframes vis-a-vis its RISC-based machine (the IBM RS/6000), it came

as quite a surprise when IBM announced that it was putting a "robust" CICS on the RS/6000 platform. What has surprised at least one SI vendor is the ease with which mainframe CICS operators can move to the downsized environment of the RS/6000. Of equal importance is the ease with which COBOL code can be moved to this robust and downsized operating environment. Now, replacing obsolete versions of COBOL becomes a business opportunity for systems integration and professional services vendors. Converting ANSI 74 COBOL applications to ANSI 85 actually primes the pump for re-engineering. If the code is just migrated, then it would be a professional services task. If the migration is part of re-engineering the code, then an SI team would be far more appropriate.

E

Key User Requirements

1. Major Buyer Issues

Earlier surveys conducted by INPUT produced a variety of client reactions to contracted systems integration projects. The research confirmed rising management expectations in many industries. Some executives brushed aside in-house proposals and contracted for major solutions. The objective was to get the system on-line early and with minimal modification. Users wanted systems that performed functions for them without direct involvement of the IS staff.

Corporations want information executives (Chief Information Officers) to manage the technology investment and oversee building of new systems. The more astute IS managers recognize the urgent need for infrastructure integration in order to provide capable platforms for supporting new demands. Businesses also identified moving from general data processing to decision support and control systems as an appropriate competitive advantage.

Though these buyer issues still hold true, there are a number of other related issues, shown in Exhibit III-3, that have become apparent. U.S. business continues to feel the pressures of competition from both domestic and foreign companies.

EXHIBIT III-3

Major Buyer Issues

- Competitive demands
- Core business focus
- Users becoming buyers
- Increasingly complex solutions
- New technology application
- Unavailable skills
- Unavailable funds

These competitive pressures are forcing organizations to look closely at their core business to identify business solutions that can differentiate their products and services from the competition. In many cases, the application of technology can make the difference in offering a superior service faster or reducing the length of product development cycles. These solutions are increasingly complex, as they change business processes and often are required to operate worldwide.

One of the key elements of business process re-engineering that carries over to IT re-engineering is the need to be quick to market. By compressing the time required for a business process, some companies can overcome such disadvantages as size, lack of experience and non-competitive prices.

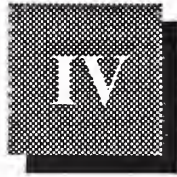
With the needs for mission-critical and individual productivity tools satisfied, users will be looking to improve workflow applications such as electronic mail (E-mail), electronic data interchange (EDI), multimedia conferencing and multimedia groupware to fill the gap.

The users will require their SI vendors to understand both their vertical industry and their individual business so well that the SI vendor can begin designing at the workflow level of the business. Unisys plans to have its SI delivery organizations focus on five industries (and the federal government) and lines of business within those industries that are transaction processing intensive.

Key user requirements will include:

- Business process redesign
- Business re-engineering
- Workflow design
- Speed
- Technology expertise, open systems
- Development environment that reduces lines of code
- Rapid prototyping ability
- Understanding of networking
- Hardware and networking decisions

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SI Vendor Perspective

Downsizing is a stimulant to the software and services market that benefits a wide range of types of vendors. In particular, downsizing is benefiting vendors with:

- Business and IS strategy consultancy skills
- Industry-specific applications software products, especially on UNIX
- High levels of network integration capability

These opportunities are not without their problems. The key players in the buying process are not IS professionals who can be “snowed” by tech talk and become enthralled by a technology that they go looking for needs to solve. Yet, they are end users, who want to talk solutions and cost/benefits and show no allegiance to any technology. This is an obstacle for equipment vendors because their sales staff have been trained to sell features, not software solutions. Equipment vendors like IBM, DEC, and Unisys have implemented plans to upgrade the field force to “solution sales teams.”

Vendors will need to change their pattern of services and skills. UNIX will replace proprietary operating systems; a UNIX-based OLTP operating system will replace a proprietary operating system; and distributed relational DBMSs and object-oriented DBMSs will replace mainframe data bases. GUI interfaces will replace dumb terminals.

In an INPUT study, *System Architectures for Downsizing*, the author identified a number of benefits of downsizing as shown in Exhibit IV-1. It is obvious from these activities that SI vendors will have a richer and much more complex environment in which to sell their skills.

In summary, opportunities are created for systems integration vendors offering high levels of industry-specific UNIX-based capability to attack the installed proprietary mainframe base.

The current strategies and plans will be based on the current driving forces and growth inhibitors perceived in the SI and PS markets.

EXHIBIT IV-1

Benefits of Downsizing

- Most accepted benefits are:
 - Improved process, product, service
 - Improved white-collar productivity
 - Better business planning and decisions
 - More effective use of information technology
 - Improved responsiveness to user information requirements
 - Broader range of choices (products and services)
- In addition, there is significant agreement that the following additional benefits or consequences will result:
 - Substantially reduced equipment costs
 - Diminished role and expense of the central IS department

A

Current Strategy and Plan

1. Overview

Most of the vendor goals and objectives identified in Exhibit IV-2 are market driven. Systems integration is a very high-level distribution channel for the complete range of information and telecommunications products and services. It provides or limits product access to the largest users in U.S. industry. Vendors who do not have access to this channel fear that they will lose market share and control of their existing customers. Many vendors have established SI divisions. The purpose of those divisions is to provide access to this distribution channel.

EXHIBIT IV-2

Vendor Goals and Objectives

- Long-term account relationship
- Decentralized services
- Full-service image and offerings
- Industry knowledge and skills
- Market coverage
- Proprietary products and methodologies
- Market participation

The information industry has evolved from a product to a services orientation and from an environment in which the customer was totally responsible for implementation to one in which vendors are assuming responsibility. Customers are seeking one-stop shopping and vendors are striving to add additional products and services so as to become full-service providers. User organizations are clearly looking outside for a single point of responsibility.

Product and service providers are adding front-end consulting and back-end operations management. Some are seeking to achieve these goals by building from within or by making acquisitions, and others look to alliances to provide this full-service image.

There is recognition that these services must be located physically close to customers. So a number of vendors have abandoned centralized SI organizations and moved SI resources into their field organizations. SI engagements are becoming oriented to the clients' site structure rather than the vendor's organization.

Vendors recognize the importance of understanding the client's business, particularly in an environment where long-term relationships are important. To achieve this goal, vendors are making significant investments in industry architectures and solutions, hiring industry experts, and establishing alliances with consulting firms or professional services firms that already have industry expertise.

The larger vendors that already have product industry coverage have established goals to improve their SI vertical industry coverage to protect their existing customer relationships. Smaller vendors are honing niche skills and gaining market coverage through alliances with the larger vendors that seek vertical industry skills.

Vendors are building and marketing proprietary products and methodologies. Solid methodologies for business analysis, requirement analysis, systems design, program management, change management, and integration and implementation improve the odds for program success and reduce the risk of catastrophic failure. These methodologies also build a record of success that can be used for reference selling. Framework products continue to be developed that can be tailored to satisfy a client's specific business need.

Finally, a growing number of secondary vendors are seeking participation in the market. Many have products that were previously sold as standalone systems, but are now candidates for integration into larger solutions. These products include basic computing equipment, robots, warehouse storage and retrieval systems, on-board computers, and a variety of communications products. Other vendors seeking SI participation include companies that have developed solutions internally and want to market these skills to others in their industry.

2. Equipment Vendors

The major mainframe computer vendors need only look at their balance sheets to realize that downsizing is having a major impact on them. Several vendors have announced plans to become solution sellers. Based on INPUT's model of an agile enterprise, a captive SI organization may not be able to respond fast enough, and with enough focus, to compete.

IBM, DEC and Unisys have all begun marketing campaigns to sell solutions rather than equipment. Some customers are going to find that difficult to believe. Unisys' software and services, for example, accounts for only 21% of Unisys' revenue, which is half of that claimed by IBM and DEC. There is some reason for skepticism. There are two obstacles that equipment vendors must overcome. The first is the tendency in equipment sales to offer services free. The second is the difficulty of adapting a line-of-business team sales compensation plan that is believable to both the sales team and the customer.

As mainframe applications migrate to the desktop and LANs, mainframe manufacturers are finding that instead of three or four competitors, they are now faced with 20!

3. Large SI Vendors

Large SI vendors will be confronted with the same problems as the equipment vendors. How can they recruit, train and restructure their business processes in order to be the type of agile enterprise that is needed in the late 1990s?

At least one major SI vendor has announced a strategic relationship with an object-oriented development environment vendor in order to use tools that it believes will reduce time to market for its deliverables. But, as has been pointed out, that is only a part of the process. This SI vendor has also focused on a few industries as part of its strategic plan. The remaining question is: can it become agile?

4. Small SI Vendors

Small vendors likely have the necessary agility, but still need the technology and the industrial focus or the ability to summon it up. The SI vendor of the future must operate like a main street business area, with a series of small enterprises, each with its own specialty. INPUT prefers to think of it as a collegium of competence.

5. SI Market Trends

An important element of vendor strategy development is assessing the impact of future market trends on the goals, objectives and strategies to achieve them. Exhibit IV-3 lists the trends with the most significant potential impact.

The projected growth and pervasiveness of information systems integration activities in most lines of business, academia, and government have attracted the attention of a new generation of domestic and foreign competitors. Management consulting, aerospace, and defense firms are also looking to commercial SI as a needed growth opportunity.

An increasing number of vendors have established application industry centers of expertise in which they have collected a critical mass of skills to focus on industry-unique requirements. For example, Andersen Consulting has five separate industry demonstration centers around the country. These organizations are developing industry architectures and products that can be tailored to a specific client's needs. This trend will continue as vendors acquire not only the skills, but demonstration centers at which to show these capabilities.

EXHIBIT IV-3

Future Trends

- Centralized focus on industry solutions
- Decentralized implementation
- Focus on program management techniques and development methodologies
- Growing marketing/promotion investment
- Expanded service offerings

At the same time there is a trend toward moving implementation resources close to the client's site, directly under the control of the local geographic manager who has responsibility for client satisfaction. The trend is to perform as much work as possible at the client site instead of the vendor's site.

Program management is clearly the key ingredient for successfully satisfying contract requirements on time and within budget. A few well-publicized "disasters" in implementing total solutions emphasize the importance of well-disciplined management techniques. Vendors will focus on this important aspect of SI, and vendors with superior systems will be more successful. Investment in developing and improving program management techniques will provide returns in both profits and reputation. Investment in end-to-end development technologies will be equally important in improving productivity and bid win rates. CASE will play an important role in this area. One management challenge will be implementing and managing these important disciplines while decentralizing implementation.

More vendors have begun to recognize the need to promote their SI and/or SI support capabilities and successes, especially in the CSI market. The approach that gives solutions to business problems will continue to gain favor because it appeals to higher levels of nontechnical management.

Vendors that are not identified with the SI market are expected to develop market strategies to enter or widen their position in the market. Some will approach known competitors. Others, with unique products or services, will address prospective clients directly, hoping for a sole-source position in the contract.

Current market participants are expanding the range of services and products they offer in order to increase their share of information services revenues. Computer vendors and professional services firms offer services ranging from business consulting through systems operations. Large vendors are aggressively attempting to become full-service providers, as discussed earlier, and to capture clients for the full range of outsourcing.

In *Systems Integration Trends and Forecast 1992-1997*, INPUT made a series of recommendations. They are listed in Exhibit IV-4.

EXHIBIT IV-4

Recommendations

- Select markets and target programs carefully
- Market expertise in application areas
- Demonstrate knowledge of technology
- Establish strong alliance programs
- Employ risk management policies
- Demonstrate risk acceptance
- Procedurize bid preparation
- Demonstrate program management skills

- Select markets and target programs that are, or can become, a natural fit for the company's skills, experience, and resources. Bring in allies or subcontractors to fill the voids.
- Market company expertise in key industries and applications to build an image with potential clients and attract valuable third-party assistance.
- Establish strong alliance programs that can help overpower the competition—but make the alliance part of the company team—to offer a united front to the client. Establish a corporate program to develop and manage alliances.

- Employ risk management assessment and containment policies and advertise the availability of these skills in the company.
- Accepting risk is an essential element of an SI engagement. Balance risk and acceptance against confidence in the ability to effectively perform.
- Use disciplined bid preparation procedures with administrative control, graphics document handling, and cost-accounting techniques.
- Demonstrate program management and user management skills with formal policies and vested authority to control the program and interface with client management directly.

The above is what would be expected from a well-structured and well-managed SI organization. If 1992 proves to be the watershed year in client/server architecture with its related downsizing of IT and the “upsizing” of the desktop, there are three additional recommendations from this report.

First, offer speed and agility to react to business processing restructuring. Second, develop a procedure for rapid prototyping that can be used to get mission-critical applications up and running as quickly as possible. Third, develop as strong a relationship with the users as had been established with IS.

B

Performance Issues

1. Cost-Driven Downsizing

Much of current drive to downsize to client/server architecture has been based on the difference in the cost of MIPS on the mainframe and the cost of MIPS on the desktop. Some SI vendors still believe that once the true costs of the desktop are evaluated or an organization has a major failure, the stampede to downsizing will slow down.

New downsizing applications will depend on business process re-engineering. That has usually been treated as an art. Fortunately, products are being developed to assist in business process re-engineering. One such product is Business Design Facility™ (BDF™) from Texas Instruments, which will be on the market early in 1993. BDF™ has the additional advantage of being compatible with the Texas Instruments Information Engineering Faculty™ computer-aided systems engineering (CASE) system.

2. Client/Server Architecture

As transactions are moved to the desktop, the client/server architecture will lead to a more complex multivendor environment in which multiple systems will need to be managed. Until "bullet-proof" OLTP operating systems are available for open systems, the desktop will remain the domain of transaction capture and report generation.

3. Downsized Code Generation

NeXT likes to discuss how it arrived at its object-oriented development environment by making a business decision to generate code 10 times as fast as the best current benchmark. After extensive research it decided that the best way to do it 10 times as fast was to write 10 times less code. NeXT feels that the NeXTSTEP development environment has given it that edge.

The current president of NeXT, Peter van Cuylenburg, relates the story of how his former company was conducting business process re-engineering in weeks only to find that the IT re-engineering would take months, if not years. The agile SI vendor will need IT speeds to match business process re-engineering speeds, at least for mission-critical business functions, that the new enterprise will expect.

SI vendors must become and remain agile enterprises supporting the new paradigm for corporations. They must find ways to create code that is specific to what their application does that other applications don't do. This is where the SI vendor will add value to the client.

Peter van Cuylenburg sees an entirely new class of software called ObjectWare coming into existence in three forms: foundation objects, which provide the framework required by any application, such as painting a window, printing, or saving a document; commercial off-the-shelf objects, which can be purchased to provide a specific, common functionality; and user-created objects, objects that SI vendors create to provide custom functionality to match a business need.

Because of this need for speed, the traditional monolithic SI project that follows the waterfall project steps will be a thing of the past. Customers will demand a quick rollout of prototypes and limited-mission systems as soon as they are available.

Products from Cooperative Solutions that are designed for the Microsoft Windows environment are available for developing client/server applications. INPUT feels that client/server applications are only the first step.

NeXT believes that development environments will become so strategic that it has changed its business marketing strategy to reflect its investment in an object-oriented development environment (OOD). As an example, a report written by Booz-Allen & Hamilton and published by NeXT compares NeXTSTEP with other environments.

Like NeXT, Powersoft Corp. of Burlington, MA is marketing a tool set that will be useful because it supports an OOD. Unlike NeXT, it supports the development of client/server applications in the more open environment of Microsoft Windows 3.x. Powersoft has also announced plans to offer its product with an Apple/Macintosh front end.

CenterLine Software, Inc. of Cambridge, MA is offering UNIX C and C++ programming environments. Though this organization is not making some of the productivity claims being made by some of the other vendors, it does offer products for the open environment of UNIX which can use object-oriented techniques.

Object-oriented programming (OOP) is important to the microcomputer GUI programmer. It is becoming important to the large-scale programmer as object-oriented COBOL is announced. OOP is not only a theory and a product, it is a discipline that lends itself to team programming and well-organized code. Even better, the main beneficiaries are users, not programmers.

SI vendors will find that there are several OOD products now appearing on the market because of the lack of products for the early implementors of client/server applications.

Users will benefit in two ways:

First, object-oriented data base management systems (OODBMSs) can fulfill the promise of desktop multimedia. OODBMSs treat all data the same. Whereas SQL has tried to work around images, sounds, or video, OODBMSs treat them directly.

Second, combining OOP with OODBMSs results in object-oriented operating systems that allow programs to work together. The building-block approach makes writing system-level and applications-level programs much easier. The NeXTSTEP operating system uses this technology. Up until now it could only be purchased on a NeXT computer. It is now being released for the Intel I486 chip set.

NeXT will not have the market to itself for long. If Apple Computer, Inc. and IBM are successful with Taligent and the Pink operating system, a portable object-oriented operating system will be available on the RISC-based PCs from that team.

In summary, the requirements for SI performance within downsized organizations are to provide the ability to generate mission-critical business solutions as quickly as a business re-engineers its business process, with as few lines of new code as possible. The SI vendor will be judged on its agility, its understanding of the industry and business, and its ability to apply technology to mission-critical user problems. Large size will no longer be a positive factor. Being able to throw bodies at a problem will no longer be a positive factor.

C

Competitive Environment

1. Summary

INPUT does not believe that there will be significant change in the top five SI vendors (IBM, Andersen Consulting, EDS, Digital, CSC) over the next two years. Inertia, if nothing else, will maintain the status quo. As the mainframe companies redefine themselves (Bull, CDC, DEC, IBM, Unisys), INPUT expects them to clearly differentiate between their computer equipment business and their SI solution business. INPUT expects other leading SI vendors to establish strategic alliances. For example, in December 1992, SHL Systemhouse announced that it had purchased Eastman Kodak Company's UNIX SI subsidiary, INTERACTIVE Systems Corporation, allowing Kodak to focus on its core business and SHL Systemhouse to offer open technology solutions. This exchange directly followed Novell's acquisition of UNIX System Laboratories (USL) from AT&T.

2. Personnel

SI vendors will no longer be able to wait for people to be spun off from the mainframe manufacturers and then apply them back to mainframe applications running in the glass house. Universities will generate students trained in UNIX- and C++ for SI entry-level personnel, but SI vendors will need to make commitments to technologies such as artificial intelligence and object-oriented development environments and then train their own people. Thus, downsizing will drive up SI vendors' training costs. If they insist on coding they must be prepared to develop "off-shore" programming factories to help reduce costs. In the long run, INPUT expects these kinds of business structures to be outperformed by the agile enterprise.

The SI vendors will need to change their mindset about prototypes in object-oriented engagements. INPUT stresses the need to be ready to rapidly develop prototypes for the users. In traditional programming engagements, these prototypes would be discarded as the "real" code is generated. By using object-oriented techniques, the prototypes can go through many interactions and even end up being a part of the production code.

3. Technology

In the past, SI vendors could watch with amusement as early implementors struggled with a new technology like object-oriented operating systems on NeXT hardware and chuckle as IBM and Apple announced the creation of Taligent and the Pink operating system. They knew that they had years to wait before the IT managers looked to them to work in those environments.

Now, the same SI vendors will need to follow just behind the early implementors on the “bleeding edge” and join others on the leading edge as they rapidly prototype applications for their clients.

SI vendors that are involved with downsizing and its basic client/server architecture can be either heartened or concerned by IBM’s decision to set up a technology consulting business unit for client/server consulting activity of only 900 people. Why not 9,000 or 90,000? Why, if IBM truly believed in client/server technology, isn’t the capability spread throughout the whole organization? SI vendors that find themselves responding to trends as they are announced in the trade press will find that such an IBM announcement can add its own form of fear, uncertainty and doubt (FUD) factor to client/server decisions.

One of the elements of the competitive environment is the establishment of centers of expertise where the collected critical mass of skills to focus on an industry can be assembled. For example, Andersen Consulting has five separate industrial demonstration centers around the country. IBM’s ISSC uses its technology center in a similar way.

INPUT believes that the open systems experience will become critical to the success of SI vendors. The SHL Systemhouse/Kodak and the Novell/USL agreements, happening in the same month, illustrate the importance of this methodology to organizations striving to control this enterprise, either through SI engagements or their LANs.

In many ways, this activity will force companies to focus on strengths and not try to be all things to all people. Users will expect to visit demonstration centers to view technology for their industrial application needs. Users will also expect to make “benchmark” visits to companies using the SI vendor’s service.

There are some forecasters who feel that the successful SI vendors of the late 1990s will need to be large and offer a full choice of services from consulting and re-engineering to outsourcing; they feel that such large enterprise will capture more of the SI market.

INPUT feels that large size is not necessarily a criterion for future success. As this report points out, the need of the late 1990s will be for

responsiveness to the speed of the business processing re-engineering that will need to take place.

INPUT has found evidence that all the major SI vendors have recognized the need to include business process re-engineering or business process change analysis as part of their SI engagement offering. This service has become so important that it is now often separated from the SI program and treated as a consulting engagement.

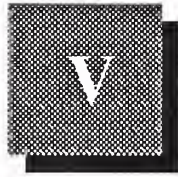
4. Impact of Reusable Code

The ability to reuse code introduces several problems into the competitive environment. First, the SI firm needs to show its clients that its application is as unique as they insist it be. Second, once reusable class object libraries are available for fundamentals and for vertical industries, how does an organization charge for code not written? Third, how will an SI organization incent analysts, programmers, and coders *not* to generate code when they have been evaluated so far by the amount of code they generate, not the amount that they can avoid?

5. Summary

INPUT has found several trends that will permit smaller SI vendors to compete with the top vendors. By applying new tools for business re-engineering, IT re-engineering, and client/server object-oriented development, smaller, more agile SI vendors will be able to remain competitive.

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Summary and Conclusions

A

Summary of Downsizing Conclusions and Recommendations

1. Conclusions

INPUT issued several reports on downsizing during 1992, a year in which evidence has been found to show that the computer paradigm is moving from centralized processing to client/server architecture, resulting in what is being called "downsizing."

The protective umbrella that rationed out technology has sprung leaks. It is raining technology on what were once staid, mainframe-dominated organizations. Whether it is top-down pressure to cut costs or bottom-up pressure to provide better service to the customer, entire enterprises are moving at a faster pace than before.

It is up to the SI vendor to try to understand what is going on and to become proactive in positioning itself for the future market. Once a market emerges, it is too late for those vendors that are not prepared. In this report, INPUT has shown the trends and questioned some of the myths associated with these trends.

Myths or not, high-level leaders of industry believe them and expect their IS managers to accomplish cost savings similar to those being claimed in open systems literature by users and vendors alike.

Unlike the smooth waterfall design shown for developing systems and the circular pool design, the SI vendor can expect severe turbulence during these phases as technology continues its 12-18-month upgrade cycle.

Research has also shown that more and more of the glass house applications will become candidates for downsizing. Thus, specific industry knowledge will become much more critical, and time will become a tactical competitive

weapon that will not allow engagements to start and SI vendors to learn “on the job.” The need for a quick turnaround will not allow junior staff to put on development jobs and expect that everything will work out in the end.

Just as the enterprise will become leaner and quicker, the SI vendor supporting that enterprise will need to make quickness a strategic weapon.

INPUT’s research on SI vendors has established recommendations for vendors as shown in Exhibit V-1. This is based on the theory that each SI vendor will struggle to show a full-service image. However, it may be necessary to build alliances or strategic partnerships to offer the full complement of services.

EXHIBIT V-1

Recommendations

- Present full-service image
- Leverage unique capabilities and products
- Establish strategic partnerships (alliances)
- Manage risk
- Develop industry-focused market strategies

Industry expertise will be essential! Centers of excellence will be a good way to demonstrate competence in an industry. Centers of excellence can also become a “main street of shopkeepers” where the center has several SI vendors, each with its own unique vertical market experience or, with even more granularity, each with a horizontal capability in the vertical market.

The introduction of object-oriented class libraries will give SI vendors that ability to develop applications-specific objects and industry-specific objects. This will be usable through the whole application industry. Once packaged and made salable, it will represent a whole new business for the SI vendor.

To medium-sized SI vendors, other opportunities may present themselves. Because of the complexity introduced into the desktop environment by downsizing, there are opportunities for what organizations called “tactical”

outsourcing. The users would turn their desktop environment over to an SI firm, which would be responsible for total desktop service and support.

B

Downsizing Impact on SI—Conclusions and Recommendations

1. Conclusions

Systems integration vendors that are positioning themselves to benefit from continuing client/server application downsizing fear that most of the current decision are being made based only on hardware and application costs. At least one hardware-based SI organization feels that once the enterprise starts adding up the total costs of downsizing, such as administration, maintenance, training, etc., it will decide that only about 20% of the cost of ownership has been used in the downsizing calculations and that downsizing may stabilize. This organization also envisions some real cost surprises in downsizing organizations, with the potential for major overruns.

Research conducted in 1992 has found that most new applications are being downsized. In turn, most SI opportunities will be in downsizing.

The mainframe computer will be given a new and different role. Maintenance work will remain on the mainframe for professional services, but totally new applications will require SI vendors.

If you are an SI vendor you must either grow large enough to offer all services or become specialized and agile enough to offer expertise not available from the larger vendors. If you believe, as do some forecasters, that larger is the way to go, you must provide a collegium of capabilities ready to satisfy varying needs rather than the traditional hierarchy that has existed in the past.

Downsizing has increased the speed with which SI vendors must respond to user demands. To increase speed, SI vendors will need people skilled in the new technologies suitable for client/server distributed processing. It appears, unfortunately, that the pool of talent available will have only mainframe and back-office skills. Companies will need to develop skills in network management, data modeling and data base integration, cross-platform and client/server development, graphical user interface design, CASE, 4GLs, C, C++, object-oriented methods, UNIX and OSF/Motif, to name a few. Try finding that knowledgeable individual from the graduating class of 1993 or from a downsized mainframe computer center.

To a consultant who has studied downsizing, it is obvious that the spectrum of opportunities is increasing from just the large jobs to all levels of jobs. Thus, the company with just a few PCs lashed together now finds that its mission-critical data may reside on a few floppy disks sitting in desk

drawers! People from a glass house background would know better, but what if the individual had come up through the user ranks with functional expertise? This becomes an opportunity for SI vendors, but what current SI vendor would want the engagement? This lends itself to a consortium of consultants who are small enough to be agile, industry and business focused, and with the technical expertise to solve the problem. A consortium could allow the business aspects of the engagement to be handled by business managers, allowing the technical staff to work the engagement and not worry about being paid, generating contracts and other legal documents, and marketing new services for engagements while engaged.

2. Recommendations

Research for this report indicates that most new money will be available for the SI vendor that prepares by re-engineering its own organization as it develops skills to help clients re-engineer their business processes and any related IT functions.

The agile enterprise will require agile employees who will be prepared to work in rapid prototyping engagements that help with the bottom line of the customer. The SI vendor must be prepared to identify its area of competence and focus on that in sufficient depth to work with client users. There will be no honeymoon for either client or vendor.

As SI vendors start working more closely with the users and their business processes, it may be time to introduce value pricing, in which the SI vendor receives a negotiated portion of any IT or business savings as part of its compensation. Another recommendation is to review all businesses as potential clients, looking for ones, such as the services industries, that may have been left behind during the PC and desktop revolution.

The modern SI vendor will need to resemble the descriptions used for modern on-line transaction processing systems. The company must be ready to handle the client's demands for solutions by being able to scale up, speed up, and be continuously available to support the new business processes.



Downsizing Definition

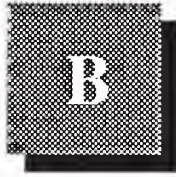
Downsizing is merely the latest term to describe (inexactly) the natural, continuing tendency of processing and data to seek their most cost-effective location in the processor hierarchy. Based on this research, INPUT published a Research Bulletin that briefly identified various concepts and products associated with downsizing (client/server, cooperative processing, RISC workstations, PC LANs, etc.). It was concluded that the term downsizing is:

- Explicit in describing the substitution of smaller (less costly) microprocessor-based platforms for larger mainframe and minicomputer platforms
- Implicit in assuming that smaller platforms with cheaper MIPS will be more cost effective

Downsizing is a simple concept, but it becomes complicated in practice. The closest synonym we can think of for downsizing is distributed processing, which is similar to cooperative processing, which is dependent on distributed data base management, which is dependent upon network management, which is dependent upon network architecture, which is dependent upon “connectivity” with other systems—and all of the above is just for building the downsized computer-communication infrastructure.

When it comes to the actual downsizing of applications, reprogramming, or conversion, or re-engineering, or porting, or whatever you want to call it, what is required is moving functions or applications from one platform to another. The success of these efforts will depend on systems software compatibility and functionality, the availability of CASE (and other) development tools, the availability of training in new technologies, and qualified personnel to do the job. Then, even with careful planning, the successful completion of any major downsizing effort is heavily dependent upon the complexity and interdependences of the application (or functions) being downsized.

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Systems Architectures for Downsizing

The client/server model always implies cooperative processing. In the client/server model, however, it is possible to find peer-to-peer computing at any level. The model calls for interaction between the desktop and a server or host computer. Exhibit B-1 shows the model as a continuum.

EXHIBIT B-1

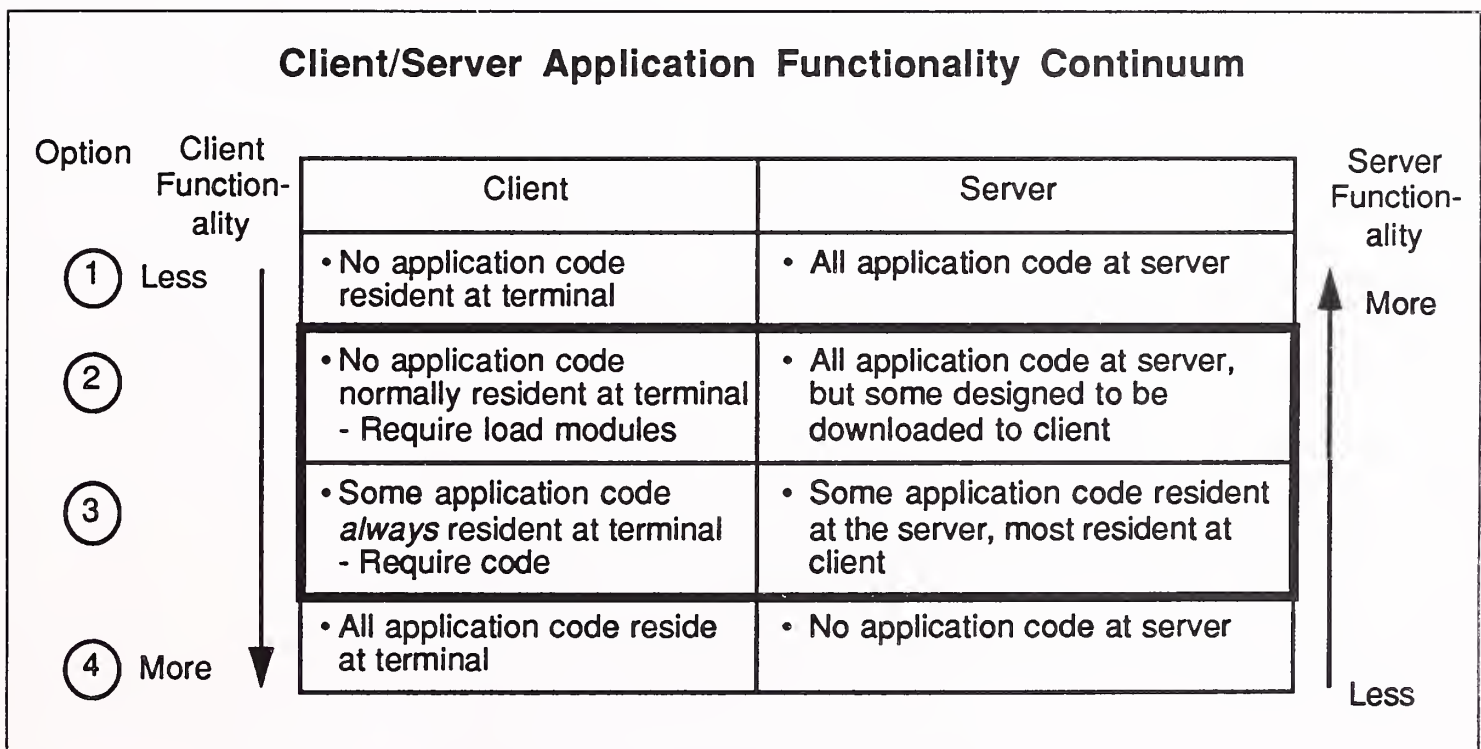





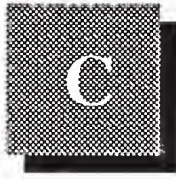


Exhibit B-2 represents the continuum divided into five commonly accepted discrete client/server application types. When viewed this way, especially if the interconnection between applications is more than a simple LAN connection to a local LAN server, it is possible to see the complexity that is available with just the term client/server application. Each application is viewed as having three layers (user interface, business logic and data management).

EXHIBIT B-2

Cooperative Processing

Distributed User Interface	Remote User Interface	Distributed Process	Remote Data Base	Distributed Data Base
User Interface	User Interface			
		Business Logic	Business Logic	Business Logic
User Interface				Data Management
Business Logic	Business Logic	Business Logic		
Data Management	Data Management	Data Management	Data Management	Data Management



Systems Integration Definition

Systems integration is a vendor service that provides a complete solution to an information system, networking or automation development requirement through the custom selection and implementation of a variety of information system products and services. A systems integrator is responsible for the overall management of a systems integration contract and is the single point of contact and responsibility to the buyer for the delivery of the specified system function, on schedule and at the contracted price.

The components of a systems integration project are the following:

- *Equipment* - information processing and communications equipment required to build the systems solution. This component may include custom as well as off-the-shelf equipment to meet the unique needs of the project. The systems integration equipment category excludes turnkey systems by definition.
- *Software products* - prepackaged applications and systems software products.
- *Professional services* - the value-added component that adapts the equipment and develops, assembles, or modifies the software and hardware to meet the system's requirements. It includes all of the professional services activities required to develop, implement, and, if included in the contract, operate an information system, including consulting, program/project management, design and integration, software development, education and training, documentation, and systems operations and maintenance.
- *Other services* - most systems integration contracts include other services and product expenditures that are not classified elsewhere. This category includes miscellaneous items such as engineering services, automation equipment, computer supplies, business support services and supplies, and other items required for a smooth development effort.

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